

Laparoscopic Versus Open Inguinal Hernia Repair: Expeditionary Medical Facility Kuwait Experience

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ABSTRACT Background: Inguinal hernia is a common surgical problem in the active duty population. The decision to perform a hernia repair in the traditional open manner versus a laparoscopic approach is somewhat controversial. Furthermore, the type of repair performed has not been analyzed in a systematic manner within an operational setting. Methods: We retrospectively reviewed all inguinal hernia repairs performed at Expeditionary Medical Facility Kuwait (EMFK) over an 18-month period, from April 2007 through October 2008. Operative times and time to return to duty were compared between active duty personnel undergoing open mesh repair and laparoscopic extraperitoneal inguinal hernia repair. Results: One hundred seventy-six consecutive patients who underwent inguinal hernia repair by six different surgeons were analyzed. One hundred and four patients had an open repair and 72 patients underwent laparoscopic repair. The mean operative time was significantly longer in the laparoscopic group (20.2 minutes, $p < 0.001$). The mean time to return to duty was significantly shorter in the laparoscopic group (2.3 days, $p = 0.008$). Conclusions: Laparoscopic inguinal hernia repair is associated with longer operative times but shorter recovery periods. The laparoscopic approach may be a viable option for patients in the expeditionary setting.

INTRODUCTION

Inguinal hernia is a common diagnosis made in the active duty population. In fact the average male carries a lifetime risk of 27%, which appears to drop after 45 years of age.¹ Men are seven times more likely to develop an inguinal hernia compared to women.² This has operational significance, as the vast majority of military members are in this demographic.

Convalescence following inguinal hernia repair may be significant. Potential loss of work hours because of surgical recovery can be critical in forward deployed units where replacement personnel are not readily available. Given the high prevalence of clinically significant hernias and the potential for prolonged recovery periods following repair, the possibility of a shorter convalescence period could be beneficial for an operational medical facility. A laparoscopic approach to inguinal hernia repair may be one potential strategy available to shorten this convalescence period. However, according to the National Hospital Discharge Survey from 2003, only 14% of all groin hernias in the United States were repaired laparoscopically.³ The potential benefits of laparoscopic inguinal herniorraphy in the operational setting remain unexplored. The objective of this study was to determine whether laparo-

scopic inguinal hernia repair offers a quicker return to duty over open repair.

MATERIALS AND METHODS

Institutional review board approval was obtained to examine all medical records of patients who underwent inguinal hernia surgery between April 2007 and October 2008 at Expeditionary Medical Facility Kuwait (EMFK). These patients were identified retrospectively by reviewing a database maintained in the main operating room.

Indications for surgical repair were based on the operating surgeon's physical exam and clinical judgment. In most cases, these patients had symptomatic inguinal hernias preventing optimal completion of assigned duties. All repairs were performed by fully trained general surgeons utilizing one of two techniques, open or laparoscopic. The open technique entailed utilizing an on-lay mesh placement with direct suture fixation of the mesh to the inguinal floor. The laparoscopic approach was completed utilizing a totally extraperitoneal technique with mesh placement in the preperitoneal space. The decision to perform an open or a laparoscopic repair was made on the basis of the individual surgeon's judgment and comfort with performing inguinal hernia repairs. There were nine patients who were excluded because of lack of follow-up data.

Further patient data were obtained by review of the electronic medical record. The collected data included the patient's age, sex, duty status, operation performed, operative time, associated postoperative complications, and time to return to duty, as documented in the surgeon's postoperative notes.

Surgical Technique

Six different board certified general surgeons were involved in the study. As stated above, the choice to perform an open or a

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laparoscopic repair was determined by the operating surgeon. All open repairs were performed in a similar manner utilizing the BardMesh PerFix Plug System. In most cases, the plug component was not utilized. However, the piece of flat polypropylene mesh was used to sew to the inguinal floor, as in a Lichtenstein tension-free hernioplasty.⁴ For the laparoscopic repairs a totally extraperitoneal approach was utilized. The preperitoneal space was dissected with an AutoSuturePDBS2 dissecting balloon. After reduction of the hernia an appropriate-sized and -sided piece of Bard3DMaxMesh was placed in the preperitoneal space. In some instances the mesh was tacked into place; this decision was left to the discretion of the operating surgeon.

RESULTS

There were 185 inguinal hernia repairs performed at EMFK between April 2007 and October 2008. Nine patients were excluded because of lack of follow-up data. Five of these nine patients underwent open repairs and four of the nine patients who were excluded from this study underwent laparoscopic herniorraphy. This left 176 patients for analysis. All patients were active duty military personnel deployed in support of Operation Iraqi Freedom or Operation Enduring Freedom. All patients were referred by primary care providers for symptomatic inguinal hernias. Symptoms included a groin bulge and/or inguinal discomfort, preventing optimal tactical performance. EMFK serves as an in-theater referral center for personnel deployed within the central command for semielective surgical procedures. The preoperative treatment goal for these patients was to repair their hernias and have them back to their units within a maximum of 30 days. This treatment algorithm minimizes medical evacuations out of theater and preserves precious operational manpower. Baseline patient characteristics were similar and are presented in Table I. Comorbidity data were not available from our database.

Of the 176 patients analyzed, there were 104 open repairs and 72 laparoscopic repairs performed. There was a significantly longer operative time associated with the laparoscopic approach, mean times of 74.9 minutes versus 55.8 minutes. However, 35% of the laparoscopic repairs were bilateral, and only 6% of the open repairs were bilateral. There was no dif-

TABLE I. Characteristics of Patients Undergoing Open and Laparoscopic Repair of Inguinal Hernia

Characteristics	Open (n = 104)	Laparoscopic (n = 72)
Age (mean ± SD)*	30.8 ± 10.6	28.8 ± 7.9
Sex		
Male	103 (99)	72 (100)
Female	1 (0.01)	0 (0)
Characteristics of Hernia		
Unilateral	98 (94)	47 (65)
Bilateral	6 (6)	25 (35)
Primary	100 (96)	72 (100)
Recurrent	4 (4)	0 (0)

Data are presented as n (%) unless otherwise noted. *P value 0.17.

ference in operative times for those undergoing a bilateral repair (see Table II).

Return to duty status was determined by the operating surgeon. This was the postoperative day on which the surgeon assessed the patient to be fit to return to his or her unit to resume their duties. The patients who underwent laparoscopic repairs were generally discharged without duty restrictions and the open repair patients were discharged with limited activity profiles for 4–6 weeks postoperatively; however, these data were not completely available from our chart review. This return to duty order was found to be 2.3 days shorter in the laparoscopic group, which was statistically significant.

Complications were tracked during the recovery period, and after the patients were discharged from care, they were lost to follow-up and no further data are available. Therefore, our follow-up interval was limited to a 2-week period. The most noteworthy complication involved a patient who had undergone laparoscopic hernia repair and developed significant abdominal symptoms postoperatively. He subsequently underwent an operative exploration on postoperative day 2 to rule out a bowel injury, which was negative. Other complications were minor wound infections and one wound seroma. All of these wound complications were superficial in nature, did not involve the mesh, and were managed with simple patient-administered wound care. One of the patients who underwent an open repair required readmission to the hospital the day of surgery for pain control with parenteral narcotics the night of surgery (see Table II).

DISCUSSION

Although there are many studies that examine open versus laparoscopic inguinal hernia repair, to our knowledge this is the first to analyze the utility of the laparoscopic approach in the operational setting. In a review article, Schwab et al. summarized the different available approaches to inguinal hernia repair and made recommendations for the surgical correction of groin hernias in German military hospitals. Their ultimate conclusion was that the specifics of the operation need to be tailored to the individual patient and that no one technique is suitable for all patients.⁵ Andrew and colleagues compared a group of 70 patients who underwent laparoscopic versus Shouldice herniorraphy at a Royal Air Force hospital. The patients included in this study were active duty servicemen but were not in the operational setting. They concluded that the laparoscopic approach was more costly and took longer but resulted in less postoperative pain and an earlier return to work.⁶ Grossman et al. reported on a series of four Israeli aviators who underwent totally extraperitoneal repairs of their symptomatic inguinal hernias and concluded the laparoscopic approach could potentially reduce the traditional 6-week recovery period allotted for their aviators to 21 days.⁷

There have been numerous civilian studies that have reported patients undergoing laparoscopic hernia repair returning to their usual activities sooner than those similar patients

TABLE II. Characteristics and Outcomes of Inguinal Hernia Repair

	Open (n = 104)	Laparoscopic (n = 72)	P
Operative Time Overall (minutes) ^a	55.8 (25–142)	4.9 (38–155)	<0.0001*
Operative Time Excluding Additional Procedures (minutes) ^a			
Unilateral	52.6 (25–142)	72.7 (39–155)	<0.0001*
Bilateral	79.6 (52–125)	88.3 (38–127)	0.57
Return to Duty (days) ^a	13.6 (2–35)	11.3 (2–22)	0.01*
Additional Procedure ^b	7 (6.7)	2 (2.8)	
Umbilical Herniorrhaphy	5	2	
Lipoma	1	0	
Abscess Incision and Drainage	0	1	
Complications ^b	2 (1.9)	4 (5.6)	0.19
Wound Infection/Seroma	1	3	
Readmission for Pain	1	0	
Reoperation	0	1	

*Statistically significant. ^aData are presented as mean (range). ^bData are presented as n (%).

who underwent open repair of their hernias.^{8–12} In these studies there were often trade-offs for this benefit of earlier return to usual activities. Frequently cited drawbacks to the laparoscopic approach are longer operative times, greater operative costs, more complications, and possibly a higher recurrence rate for the hernia. Recurrence rate may be dependent upon surgeon's experience. Highly skilled and experienced laparoscopic surgeons appear to have recurrence rates at worst equaling those of the open technique.^{9,13,14}

We found that patients who underwent laparoscopic hernia repair were able to return to their units at a significantly quicker rate. Furthermore, these patients were returned to their units without activity limitations. Anecdotally we noted the laparoscopic patient reported decreased postoperative pain, a finding duplicated in numerous other studies.^{9,10,12} Limiting the need for analgesics has obvious readiness implications for service members.

The limitations of our study are largely the result of the retrospective nature of the study design, the limited medical recordkeeping in the operational setting, and the inability to follow the patients after the return to duty order was given by the operating surgeon. We therefore have no data for hernia recurrence, pain medication requirements, or performance status of the patients after they were returned to duty. Selection bias is an unavoidable limitation in a study design such as ours. However, the individual surgeons involved in our study did their repairs either exclusively open or laparoscopic, given their training and comfort with inguinal hernia repairs. This helps explain why all four of the recurrent hernias identified in our study were repaired in the open manner and 6% of the open repairs were bilateral hernias. Despite the reported benefits of the laparoscopic approach in these circumstances (bilateral/recurrent hernias) these surgeons were not trained in the laparoscopic approach and opted to repair these hernias in the traditional open manner.

Medical readiness is an increasingly critical issue as our military has been heavily tasked over the last decade. It is therefore vastly important to keep our personnel healthy and

functioning at their highest possible level. To prevent large numbers of active duty members from being sent home for semielective surgical procedures, EMFK has evolved as a regional referral center. Given its unique location, EMFK is able to provide safe, clean, convenient, and expeditionary medical care. This aids in keeping our military members healthy, safe, and in the fight.

CONCLUSIONS

Symptomatic inguinal hernia is a common diagnosis that may interfere with the physical challenges of our active duty personnel. Surgical correction is associated with a significant recovery period. The laparoscopic approach for repair appears to be a feasible option for the general surgeon in the expeditionary setting. This approach to inguinal hernia repair may contribute to a quicker return to full duty status.

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REFERENCES

- Primatesta P, Goldacre MJ: Inguinal hernia repair: incidence of elective and emergency surgery, readmission and mortality. *Int J Epidemiol* 1996; 25: 835–9.
- Fitzgibbons RJ, Richards AT, Quinn TH: Open repair of abdominal wall hernia. In: ACS Surgery: Principles and Practice, 6th Edition, p 27. Edited by Souba WW, Fink MP, Jurkovich GJ, et al., New York, Wed MD, 2007.
- Rutkow IM: Demographic and socioeconomic aspects of hernia repair in the United States in 2003. *Surg Clin North Am* 2003; 83: 1045–51.
- Lichtenstein IL, Shulman AG, Amid PK, Montllor MM: The tension-free hernioplasty. *Am J Surg* 1989; 157: 188–93.
- Schwab R, Becker HP, Fackeldey V: Inguinal hernia repair in German Military Hospitals. *Mil Med* 2004; 169: 962–5.
- Andrew DR, Middleton SB, Richardson DR: A comparison of laparoscopic and open inguinal hernia repair in servicemen. *J R Army Med Corps* 1994; 140: 76–8.
- Grossman A, Barenboim E, Azaria B, Sherer Y, Goldstein L, Korienski J: Laparoscopic inguinal hernioplasty in aviators. *Aviat Space Environ Med* 2005; 76: 141–3.

8. The MRC Laparoscopic Groin Hernia Trial Group: Laparoscopic versus open repair of groin hernia: a randomized comparison. *Lancet* 1999; 354: 185–90.
 9. Neumayer L, Giobbie-Hurder A, Jonasson O, et al: Open mesh versus laparoscopic mesh repair of inguinal hernia. *N Engl J Med* 2004; 350: 1819–27.
 10. Collaboration EH: Laparoscopic compared with open methods of groin hernia repair: systematic review of randomized controlled trials. *Br J Surg* 2000; 87: 860–7.
 11. Memon MA, Cooper NJ, Memon B, Memon MI, Abrams KR: Meta-analysis of randomized clinical trials comparing open and laparoscopic inguinal hernia repair. *Br J Surg* 2003; 90: 1479–92.
 12. McCormack K, Scott NW, Go PMNYH, Ross S, Grant AM: the EU Hernia Trialists Collaboration. Laparoscopic techniques versus open techniques for inguinal hernia repair. (Review) *Cochrane Database Syst Rev* 2003; (1): CD001785.
 13. Mazeh H, Beglaibter N, Grinbaum R, et al: Laparoscopic inguinal hernia repair on a general surgery ward: 5 years' experience. *J Laparoendosc Adv Surg Tech A* 2008; 18(3): 373–6.
 14. Pokorny H, Klingler A, Schmid T, et al: Recurrence and complications after laparoscopic versus open inguinal hernia repair: results of a prospective randomized multicenter trial. *Hernia* 2008; 12(4): 385–9.
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